AUSTRALIAN PLANT DISEASE RECORDER

Volume 12, Number 2 April, 1960.

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CONTENTS

PLANT DISEASE NOTES	Page
Cereals and grasses	9
Vegetables	11
Fruit	14
Ornamentals	24
Miscellaneous	25

For confidential circulation to plant pathologists in Australia.

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COMMONWEALTH MYCOLOGICAL INSTITUTE
6 JAN 1961

PLANT DISEASE NOTES

CEREALS AND GRASSES

FOOT ROT OF RICE:

Rice growing in the Northern Territory for the three years prior to the 1957-58 season had not been beset by any serious disease epiphytotic though Helminthosporium oryzae was a common leaf spot, whilst Piricularia oryzae, Ustilaganoidea virens and other fungal pathogens had been detected.

During the 1957-58 season a foot rot disease appeared in rice crops being grown in the Adelaide River area and its environs, about 50 to 70 miles south to south east of Darwin. It is not clear when the disease was first apparent but by late March, when the early maturing Blue Bonnet was out in ear, the disease was quite evident.

The early symptoms closely resemble those of Take-all in wheat, where, before the heading stage is reached, irregular light green to grey coloured patches appear throughout the rice bays. Lodging may occur within these infected areas and in more advanced cases patches may die out. As the crop approaches maturity and irrigation water is drained off, the foot rotting effect often becomes more widespread.

Blue Bonnet, which is very promising agronomically in the Northern Territory, was the variety affected to the greatest degree; in some cases to the extent of almost 100%. Rexoro and Zenith, early maturing American varieties like Blue Bonnet, were also very susceptible. Fortuna and Gopher Short possibly possess some field resistance. The later maturing Asian varieties may be disease escaping but more observations are required for confirmation.

By isolating it repeatedly in the laboratory and by carrying out inoculation tests both in the field and laboratory the causal organism has been found to be a Fusarium. It was readily pathogenic at 35°C but after several weeks at 20° C there was no evidence of pathogenicity. A study of the temperature data for Darwin during the January-April period for the past four years indicated that the monthly means for 1958 were above those of the previous three years, e.g. February mean maximum was 2.8 to 4.4° F above mean maximums for the previous three years.

The Fusarium sp. has not been typed but it is possibly a different organism from Giberella fujikuroi of Japan, because the characteristic symptom of gigantism in the field, produced by the Japanese organism, is absent from the Northern Territory disease.

A Fusarium has been isolated from a native sedge, Fimbristylis microcaria, which grows profusely in the rice bays, and from wild rice both in proximity to the cultivated rice and in uncultivated areas. This aspect of the disease requires further investigation.

There is ample evidence of seed infection which provides an easy means of distribution. Various seed treatments have been tested but the desideratum of absolute control has not ben obtained. Treatments tested include hot water steep, formalin steep, ethoxyethyl mercury chloride steep, panogen fumigation, methyl mercuric nitrile fumigation, ceresan dust and T.M.T.D. dust.

Laboratory testing for seedling resistance of varieties grown in the Northern Territory has been undertaken. Blue Bonnet, one of the most susceptible varieties in the field, was not affected to the same degree as varieties which withstood the disease to some degree in the field. Accordingly assessment of resistance or disease escaping properties of varieties can be made only by observations in the field over a number of years.

Further work, particularly observations during the next few seasons, is necessary before the economic importance of the Fusarium Foot Rot to the Northern Territory rice industry can be assessed.

- J.R. MORSCHEL

Department of Health,

CANBERRA

VEGETABLES

CELERY ANTHRACNOSE:

In May 1959 reports were received from two districts in the Brisbane Metropolitan area of a disease attacking the petioles and young growth of celery.

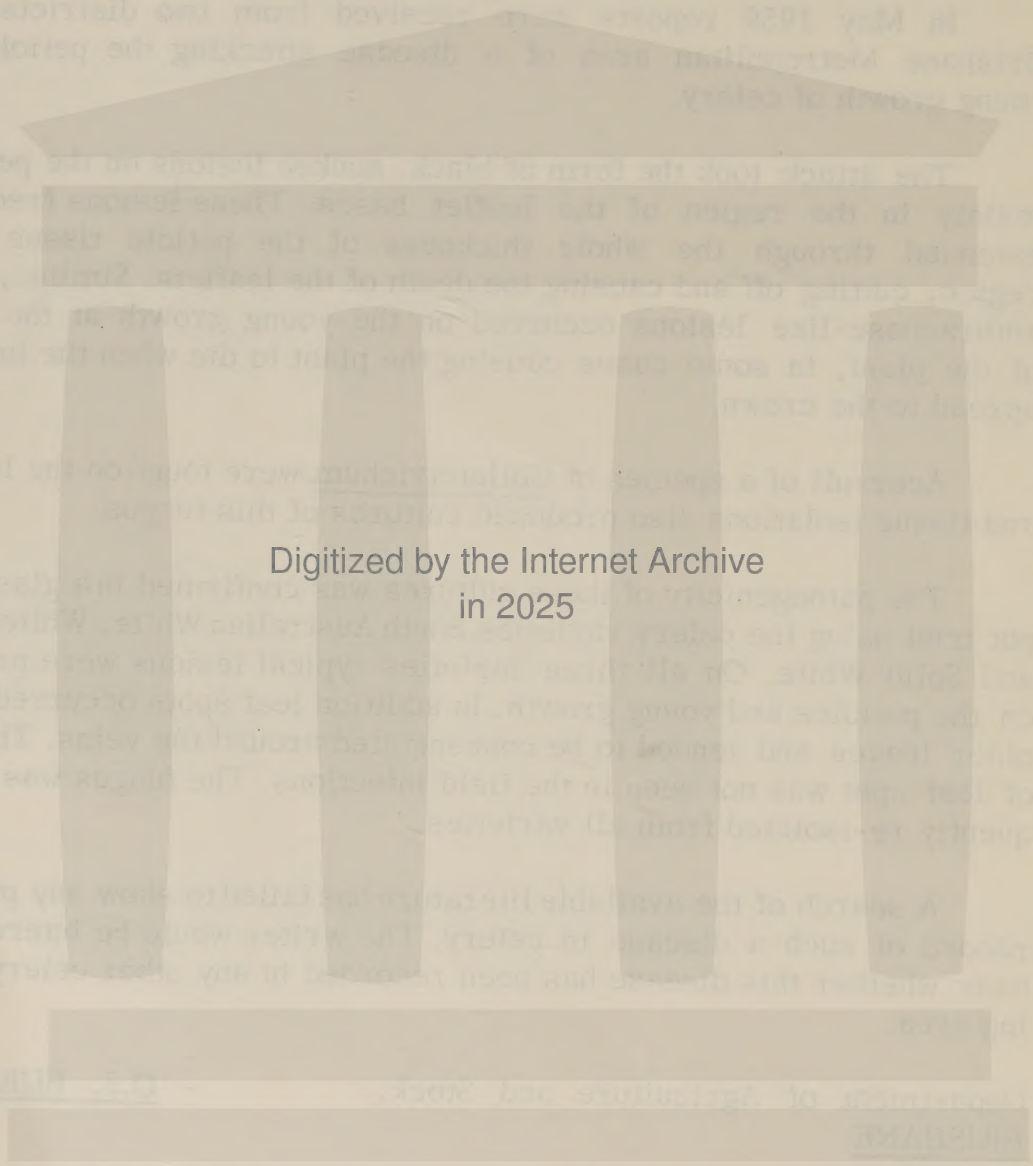
The attack took the form of black, sunken lesions on the petioles, mainly in the region of the leaflet bases. These lesions frequently extended through the whole thickness of the petiole tissue in this region, cutting off and causing the death of the leaflets. Similar, black, anthracnose-like lesions occurred on the young growth at the centre of the plant, in some cases causing the plant to die when the infection spread to the crown.

Acervuli of a species of Colletotrichum were found on the lesions, and tissue isolations also produced cultures of this fungus.

The pathogenicity of these cultures was confirmed in a glasshouse pot trial using the celery varieties South Australian White, White Plume and Solid White. On all three varieties typical lesions were produced on the petioles and young growth. In addition leaf spots occurred on the older leaves and tended to be concentrated around the veins. This type of leaf spot was not seen in the field infections. The fungus was subsequently re-isolated from all varieties.

A search of the available literature has failed to show any previous record of such a disease in celery. The writer would be interested to hear whether this disease has been recorded in any other celery growing area.

Department of Agriculture and Stock, BRISBANE - O.J. BURDEN



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BACTERIAL CANKER:

Bacterial canker of tomato has been present in crops in the Stanthorpe area during the autumn of this year. The outbreak was the most serious in Queensland since the 1936-40 period when it was recorded widely in this State.

There are indications that the trouble was brought in with the seed on this occasion. Both Grosse Lisse and Daydream varieties were affected, the latter appearing to be much more susceptible.

- J.C. JOHNSON

Department of Agriculture and Stock,

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INHIBITORY EFFECT OF SOAKING ON GERMINATION OF BEAN SEED:

Soaking French bean seed in 0.1% Agromycin in an attempt to eliminate bacterial infection resulted in poor germination in the field and the plants were backward compared with those from undipped seed.

This effect was repeated in a pot experiment with four French bean varieties planted in unsterilized red loam. Soaking for 19 hours in rain water and in 0.1% Agromycin reduced emergence considerably compared with that of unsoaked seed. Examination of unemerged seed showed that some were apparently still healthy while others were rotted. Pythium spinosum Saw. was consistently isolated from the latter.

This is in accordance with the results of Eyster (Amer. J. Bot. 27, 652, 1940) who ascribed the main inhibitory effect of soaking bean seed in water to the loss of essential cell constituents (proteins, digestive enzymes, and growth promoting substances), while bacterial action was also involved.

- D.S. TEAKLE

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FRUIT

TRANSMISSION OF JOPPA BUD-UNION RINGING:

It has been known in Queensland and N.S.W. for many years (see Plant Diseases Conference 1, 126, 1955) that in certain bud lines of Joppa orange worked on rough lemon stock, a ring of roughened, broken bark develops at the bud union, whereas other bud lines of Joppa produce no such abnormality. A similar bud union disorder appears to be rather prevalent in many parts of the world (McClean & Engelbrecht, S. African J. agric. Sci. 1 (4), 389-410) affecting a number of sweet orange strains on rough lemon stock. Recently Knorr has described a disease under the name of Podagra, affecting kumquats on rough lemon stock in Florida, which is characterised by the development of a wide band of rough, broken bark at the bud union.

In January 1958 propagations of a ring-free line of Joppa orange and of Nagami kumquat were made on rough lemon stock. At the same time an inoculating bud from a ring-affected Joppa was placed in the rough lemon stock some inches below the scion bud. The inoculating bud was not permitted to grow. At the present time inoculated Nagami kumquats are beginning to show enlargement and the development of broken tissue at the bud union. No symptoms are showing on uninoculated Nagami, nor on inoculated or uninoculated Joppa trees.

- L.R. FRASER

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CITRUS XYLOPOROSIS VIRUS:

In 1957 a planting of three year old Ellendale mandarins on trifoliata stock in a Griffith orchard was brought to notice. Many trees were very yellow and were showing dieback; several had died. The stems of affected trees showed shallow, rather broad pits or depressions with accumulation of brown gum in the bark, particularly above these pits and also at and just above the bud union. The symptoms closely resembled those of xyloporosis (Cachexia) as described for Orlando tangelo in Florida. Seedling Orlando tangelos were inoculated by budding from affected trees, and symptoms of xyloporosis are now showing in several of the most advanced of these.

Later, a similar planting of declining Ellendales on trifoliata stock was found at Narromine, of the same age as those at Griffith. No record of the source of the budwood had been kept by the nursery where these trees had been grown, so the condition of the parent tree or trees could not be ascertained. In view of the severe nature of the symptoms induced in the young trees on trifoliata stock it seemed a possibility that the buds may have come from a tree on rough lemon stock and that the symptoms of xyloporosis were intensified by the trifoliata stock. Subsequently a single tree of Ellendale on rough lemon stock in a home garden was found to show bark pitting and gum deposits and also cankering at the bud union, as described for xyloporosis in sweet lime. The tree, however, though it had suffered from die-back in the past, is now in moderately good condition and is over 20 years old.

Symptoms resembling xyloporosis have also been seen in two trees of Sampson tangelo on trifoliata stock but in a less severe form.

- L.R. FRASER

Department of Agriculture,
SYDNEY.

FLORIDA GUMMOSIS - A RETRACTION AND REASSESSMENT:

In 1951 and 1953 outbreaks of gumming and blistering in grapefruit trees and in some navel orange trees at Curlwaa, N.S.W., in Valencia orange trees at Niagara Park near Gosford, and in Wallent mandarins at Arcadia were diagnosed as Florida gummosis. In subsequent years similar gumming was seen, particularly on Florida Surprise navel oranges at Curlwaa, Narromine, etc., and in Washington navel oranges at Barooga and Curlwaa. These oranges showed, in addition to gummosis, a strong psorosis leaf pattern in the spring. This fact, and the observation that in Valencia orange trees at Niagara Park, which showed severe gumming in 1953, the gum lesions healed with psorosis-like scaling, and also the mode of origin of the gum blisters, lead me to conclude that this disease was a type of psorosis (Plant Disease Conference 1955, 1, 121). However, no psorosis leaf symptoms were induced in indicator seedlings by inoculation from infected grapefruit, Wallent mandarins or the Niagara Park Valencias. During 1958-9 scattered cases of gummosis were found in grapefruit, calamondin and Washington navel orange where there were no psorosis leaf symptoms, nor could any be induced by budding to indicator seedlings. It seems clear that gummosis is a disorder quite distinct from psorosis, and the association which lead to the misconception was a fortuitous one, the Surprise navels and the Barooga navels carrying (in addition to gummosis) concave gum psorosis and the Curlwaa navels carrying a mild type of psorosis which has not so far resulted in scaling, though the trees are now about 50 years old.

In 1958 Calamondins in localities as far separated as Tocumwal, Narara and West Pennant Hills showed more or less severe gummosis. The West Pennant Hills outbreak was in yearling nursery trees, almost every tree of about 100 propagated being affected, though no other variety in the same nursery showed symptoms. As is usual with this disease, the gum blisters healed rapidly and no further disease development has occurred in them.

As a result of these and other field observations it is suggested that Florida Gummosis could be a virus disease which is bud transmitted and also occasionally insect transmitted, and that it is usually

latent, but occasionally causes the formation of gum blisters or larger areas of gumming, originating as a breakdown of the cambium. In most cases the outbreak has been observed to follow a condition of stress such as hard cutting back, heavy fertilizer application, drought and heat, or a combination of these. No symptoms have as yet developed in inoculated seedlings of various kinds.

- L.R. FRASER

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SYDNEY.

UNUSUAL INCIDENCE OF CITRUS BLACK SPOT:

Citrus black spot (Guignardia citricarpa) normally occurs in Queensland on ripe or near ripe fruit maturing during warm weather. However in 1957, and again this year, an a typical form of black spot has been common on green citrus fruits in the Gayndah district.

Green fruit of most varieties were affected to some extent in the Autumn and early Winter of 1957, and even late Valencia oranges developed lesions several months before the fruit matured, In the current season the disease has been observed mainly on early orange varieties.

The blemishes consist at first of numerous reddish-brown to brown "freckles" on the exposed surfaces of the fruit. Initially, the freckles are merely diffuse surface blotches, but small, sunken lesions develop later. The causal fungus is readily isolated from the freckles, and pycnidia may also develop on the sunken spots.

In both years Gayndah has experienced abnormally dry, hot weather in the late summer and autumn. Apparently these conditions can bring about the development of the black spot latent infections, even in the immature rind.

- B.L. OXENHAM

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STEMPHYLIUM ILICIS TENGWALL ON PEACHES IN N.S.W.:

In February, 1960, an orchard of 300 peach trees of the variety Golden Queen at Griffith, N.S.W. was found to be affected by a black rot caused by Stemphylium ilicis Tengwall, 0.7% of the fruit in the trees and 23.9% of the fallen fruit being affected. This would appear to be the first record of this disease in Australia.

On natural media (peach fruit) the conidia were formed singly on short, unbranched, geniculate, conidiophores, buffy brown to dark olive buff in colour, 10-60μ long and 3-6μ wide. The conidia are formed acrogenously, their shape varying from spherical to ellipsoid to pear-shaped to obclavate. The spores are constricted at the septa and coloured pale to buffy brown. The overall length of the spores ranges from 14.8 - 75.5μ (Mean 38.2 μ ; standard deviation 11.6μ) and the width ranges from 6.6 - 14.8μ (Mean 10.9μ ; standard deviation 2.2μ). The spore body is provided with 2-8 transverse septa and 0-4 longitudinal septa. 27% of the spores are provided with a beak 8.2 - 16.4μ long and 4.5 - 7.0μ wide.

Following culture on potato-dextrose agar, the majority of the conidia occur singly, but occasional chains of 2-4 are formed. The overall spore length ranges from 13.0 - 60.0μ (Mean 21.8μ ; standard deviation 5.2μ) and the width from 6.5 - 16.4μ (Mean 8.6μ ; standard deviation 1.3μ). The spore body is provided with 1 - 8 transverse and 0 - 3 longitudinal septa. 42% of the spores are provided with a beak, 3.3 - 18.0μ long and 4.0 - 7.1μ wide.

The organism conforms most closely in its characteristics to the "Cucumber II" isolate of Neergaard (Danish species of Alternaria and Stemphylium, 1945). Similar organisms have been reported by English and Gerhardt (Proc. Amer. Soc. Hort. Sci. 40, 172, 1942) attacking cherries in the U.S.A. and by Svolba (Gartenbauwissensch. 7, 282, 1932) on plums in Austria. The relationship between the above organism and Macrosporium persicinum McAlpine cannot be determined, because of the incomplete description of the latter organism.

- C.J. SHEPHERD.

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A STRAWBERRY FLOWER INFECTION:

While investigating the possible causes of fruit deformity in strawberries, a Gloeosporium was isolated from discoloured flower styles. This fungus was identical to the one described by Sturgess Qld J. agric. Sci. 14 (4), 241, 1957) as causing a strawberry ripe fruit rot, and also affecting stolons, leaf stalks and peduncles. There is no previous record of this fungus attacking the floral parts.

Flower inoculation tests were carried out and it was found that with a concentrated spore suspension the flowers were completely blighted. The styles and petals turned brown, and no further development took place. When lower quantities of inoculum were used partial infection of the flowers occurred. Some styles were infected and turned brown while the healthy styles remained yellow for a time. Fruit development failed to take place in the area where the styles were diseased, while normal fruit development took place below healthy styles. These partially infected flowers then produced distorted fruit. The amount of style damage determined the severity of the fruit distortion.

During the course of the investigation it was evident that several other factors, such as cold winds, copper sprays and thrips damage also contributed to fruit distortion.

- BARBARA L. WINKS

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BRISBANE

ROOT ROT OF BANANAS:

It has long been observed in New South Wales that the cord-like roots which radiate from the corm of the Cavendish banana bear numerous reddish-brown cortical lesions. Damage may be so extensive as to destroy the root or to reduce it to a short stub, functional for only a few inches from the corm. Affected plants are poorly anchored in the ground and under the weight of a maturing bunch are readily uprooted. The number of fruit in a bunch borne on an affected stool is reduced and individual fruits are often smaller. Affected stools do not respond optimally to fertiliser application, irrigation or other cultural practices. Root rot first becomes evident in scattered patches in a plantation but these patches frequently increase in area and merge until, in the fourth or fifth year after establishment, the plantation may have degenerated to the stage where its continued cultivation is no longer economic. The problem is widespread in New South Wales growing areas and remains the most serious disease problem against which no effective control measures are at present recommended.

High populations of the burrowing nematode, Radopholus similis (Cobb) Thorne, infest the soil surrounding failing plants. Longitudinal sections of cord roots cut to include a suitable lesion and stained with lactophenol cotton blue, show burrowing nematodes to be associated with the lesion. Investigations to determine the role of R. similis in banana root rot, were commenced in 1958.

In June, 1959, a pot experiment was set up in an attempt to complete Koch's postulates. Banana seedlings were established in pots of steam-sterilised soil and the following inocula introduced:

(a) R. similis at the rate of approximately 400 nemas per six inch pot.

(b) Composite inoculum of a number of isolates of Fusarium oxysporum varieties roseum and moniliforme obtained from infected roots.

(c) R. similis, 400 nemas per 6'' pot plus F. oxysporum

(d) Nil

The root system of each plant was examined after six months for evidence of infection. Results are set out in the accompanying table.

THE EFFECT OF INOCULA COMPRISING FUSARIUM OXYSPORUM AND RADOPHOLUS SIMILIS ON THE DEVELOPMENT OF ROOT ROT IN POTTED SEEDLING BANANAS

Inoculum	No. of Healthy Roots per plant					Mean Percentage Healthy Roots
	Plant 1	Plant 2	Plant 3	Plant 4	Plant 5	
Control - Uninoculated	16/16*	18/18	12/12	13/14	16/17	97
Fusarium oxysporum	12/12	14/15	16/16	18/18	10/12	96
Radopholus similis	4/16	10/18	6/12	12/17	8/15	51
R. similis plus F. oxysporum	14/22	6/16	10/22	10/14	12/18	56

* $\frac{\text{No. of healthy roots}}{\text{Total no. of roots}}$

Where R. similis alone was introduced, extensive root destruction occurred of a form identical with that observed in the field. Where both R. similis and F. oxysporum were used the results were similar to where the nematode alone was introduced. Pathogenicity of the F.

oxysporum isolates in the absence of the nematode was not established and it is concluded that R. similis is a primary pathogen, possibly the most important locally in the disease, banana root rot.

- C.D. BLAKE

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MURWILLUMBAH, N.S.W.

ORNAMENTALS

WHITE RUST OF GERBERA:

In May, 1960, plants of Gerbera jamesonii Bolus in a bed at the Botanic Gardens, Brisbane, were found severely infected with white rust, a disease of the gerbera not previously recorded from Queensland. A gardener at the Botanic Gardens claims that he saw this disease in the Gardens and in the Brisbane suburb of Bardon last year, and that he then thought it was a scale. It has reappeared this year in both locations.

Infected leaves were easily detected by the chlorotic blotching of their upper surfaces. On the under-surfaces of infected leaves were numerous sori, mostly 1-2 mm. in diameter, and often confluent. Frequently, regular necrotic areas up to 7 mm. in diam. developed in the infected leaves and sometimes larger, irregular areas of the margin became necrotic. Clearing of this necrotic and adjacent tissue revealed the presence of oospores.

This pathogen was identified as Albugo tragopogi S.F. Gray (syn. Cystopus cubicus de Bary), a species which has been collected previously in Queensland on Helianthus annuus L. The oospores were 40 - 49μ in diameter, dark brown, the epispore 3μ thick and finely reticulate, the areolae 3μ wide. The sporangia were mostly short cylindric, with some globose, 13.5 - 22μ in diameter, hyaline, with a distinct internal equatorial thickening of the epispore.

- D.G. PARBERY

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University of Queensland,
BRISBANE

MISCELLANEOUS

SOIL-BORNE DISEASES OF PINUS:

An investigation of the organisms causing damping-off and root rotting in Pinus nurseries in South Queensland has been proceeding. Various organisms have been isolated from diseased plants and the adjacent soil, and have been tested for pathogenicity.

Soil inoculation tests in the glasshouse have shown Phytophthora cinnamomi, Pythium ultimum, P. debaryanum and Rhizoctonia solani to cause damping off of Pinus radiata and Pinus elliottii seedlings. Pythium vexans, P. helicoides, Fusarium oxysporum and F. solani are frequently isolated but have caused little or no damping off in pathogenicity tests. The two Fusaria, however, cause rotting of the seed and seriously affect germination if the soil is inoculated before planting.

Phytophthora cinnamomi has caused serious losses of larger plants in two nurseries and has rotted the roots of one and two year old trees of five Pinus species in pathogenicity tests. This fungus has been consistently isolated from the roots and surrounding soil under large P. elliottii and P. taeda trees in several localities. It is strongly suspected of being a primary cause of some plantation losses of pines which occurred during the 1957 drought.

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and
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